Claims

1. A protective relay for an induction motor, using thermal models and having known operating parameters, comprising:

a circuit for determining I^2t values in the motor;

means for establishing a first thermal threshold value for a start condition of the motor;

means for determining a representation of the thermal condition of the motor during the start condition thereof, comparing said thermal representation with the first thermal threshold value, and producing an output signal when said first thermal threshold value is exceeded by said start condition thermal representation;

means for establishing a second thermal threshold value for a run condition of the motor, wherein the second thermal threshold value is lower than the first thermal threshold value and wherein the run condition of the motor is substantially cooler than the start condition of the motor;

means for determining a representation of the thermal condition of the motor during the run condition thereof and comparing that representation with the second thermal value and for producing an output signal when said second thermal threshold value is exceeded by said run condition thermal representation; and

a system for calculating a transition to the first thermal threshold value, wherein the transitioning thermal threshold value is proportional to the motor I^2t value.

2. The relay of claim 1, wherein the transitioning system includes a fixed offset value of current, such that the thermal threshold value increases during transition from said fixed value, the transitional thermal threshold value thus being always ahead of the motor I^2 value during normal operation of the motor.

3. The relay of claim 1, wherein a transient current pulse to the motor does not result in a transition to the start condition thermal threshold.

4. The relay of claim 2, wherein the first and second threshold values and the start and run condition thermal representations are for a rotor portion of the motor.

5. The relay of claim 2, wherein the representation of the thermal condition of the motor for both the start condition and the run condition includes a representation of the heating effect within the rotor, the thermal capacity of the rotor, and the cooling effect of the motor.

6. In a protective relay for an induction motor which includes a start condition thermal model, a run condition thermal model and a processing circuit for producing an output trip signal when trip thresholds associated with the thermal models are exceeded, wherein the relay includes a start condition trip threshold and a run condition trip threshold, the start condition trip threshold being higher than the run condition trip threshold, a system for transitioning the trip threshold to the start condition trip threshold, comprising:

a circuit for determining I^2t values in the motor; and

a system for calculating a transition to the start condition trip threshold, wherein the transitioning trip threshold follows the I^2t value until it reaches the established start condition trip threshold.